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These outlines are to be understood as merely setting in mathematical terms the goal to be reached from grade to grade in what is believed to be a rational and perfectly feasible course, leading to and preparing for the secondary school in such a way as to meet practical requirements of everyday life much better than does the usual curriculum, and to make the elementary and secondary schools organic parts of a homogeneous whole. It would be both unwise and impracticable to give to each teacher specific directions as to *how* each step is to be taken. To think out means for her particular grade is both the privilege and the duty of each teacher. What the subject-matter of mathematics is, and how it shall be presented from day to day, depends so largely upon what the other work is that the teacher who plans the other work is, in fact, the only one who can successfully deal with the question of the way the ends specified above are to be realized in her own grade. Successful correlation can accomplish the specified results, and to be successful correlation cannot be satisfied with less.

NOTE.—The work in applied mathematics, outlined last month, has been delayed by cloudy weather and other circumstances. It will therefore be finished during this month.

NATURAL SCIENCE.

WILBUR S. JACKMAN.

REVIEW OF WORK FOR OCTOBER.

The study has been based almost wholly upon the subject-matter furnished by outdoor observation.

1. A field trip to North Chicago gave opportunity to observe the development of a valley through erosion. This valley furnished fine illustrations of how plants colonize and adapt themselves to the varied conditions presented along the course of the stream.

The head of the stream is surrounded by a dry upland covered with fine grass. In one part of this there is a slight depression, which, though dry at the time of the visit, being covered with sedges and punctured with holes made by crawfish, bespoke the nearness of water. A few yards below, in the direction indicated by a shallow trough in the surface, running water appeared. A small pool that was formed was almost clogged with algæ and fine rushes. As the stream increased somewhat in size and by its winding formed miniature marshes, sedges, rushes, flags, cat-tails, and willows became more and

more abundant. The adaptations of the rush to the water, of the flags to the shallower parts, of the sedges to the mud, of the willows to the banks, were easily seen.

2. A second trip was taken with the grades to large swamp areas, for the purpose of noting something of the preparations being made by the plants and animals for winter. Great numbers of cocoons of the *Crecopia* moth and other insects were gathered from the willows and elsewhere. A few snails were gathered from the bottom of pools, but nearly all were too deep in the mud. Several belated frogs and two or three garter snakes were found, and one young but enterprising girl, working down almost an arm's length into a hole, drew forth a crawfish—the only one secured on the trip. A lucky throw of the dredge brought out a fine collection of leaches.

On the same trip many different kinds of seeds were found, most of which were ripe and were being disseminated.

3. The rooms are furnished with aquaria, insect cages, and vessels of various sorts adapted to the preservation of materials gathered. A review of the field trips and the study of the material collected have given rise to much reading, writing, drawing, and painting throughout the school.

The museum is provided with very large models of the silkworm, the snail, and the leach, and something has been done with the study of the anatomy of these animals which throws some light upon their habits.

4. With the members of the first-year class in the professional school some attention has been given to the sources of interest in nature for children as well as for themselves. A plan for recording the events of the season has been partially developed. Some instruction has been given in the use of different instruments. A skiameter (see October) has been constructed in the yard, and the readings have commenced. The temperature of the soil has been taken at different depths. Tables showing the results will be given in a later number.

The class has been representing the changes of the landscape by means of water-colors. For these lessons different views afforded by the scenery in Washington Park have been painted.

5. The second-year students have made preparations to teach in the eighth grade the general adaptation as illustrated by the changes in nature in this season. The points used are those suggested by the phenomena of migration, hibernation, etc.; the distribution of seeds; the development of bulbs and other underground parts; the fall of the leaf as a device of the plant to meet the exigencies of the season. These lessons include some work in meteorology.

6. The school building has a slightly sloping south frontage of one hundred and eighty feet. This has furnished a capital place for planting some bulbs for spring flowering. Nine beds have been prepared, one for each grade, including the kindergarten; and in each one, one hundred tulip bulbs have been planted. In addition, the pupils have planted about three hundred

daffodil bulbs and as many crocuses. The last are scattered at irregular intervals around the schoolhouse in the newly seeded lawn.

7. For the ensuing month the work will pursue much the same course. Additional records will be developed and results will be tabulated for further study.

FIELD WORK.

IRA B. MEYERS.

ANIMAL LIFE.

(For "Plant Life" see *COURSE OF STUDY*, Vol. II, No. 2.)

THE various forms of animal life of a region are as closely associated, in their habits and distribution, with the topographic features of the area they occupy as is the plant life. Lake, shore, marsh, stream, prairie, and woodland each has its particular animal society wholly characteristic, in its physiognomy, habits, and distribution, of the area it occupies.

In any area the factors most influencing plant structure, distribution, and habit are moisture, soil, light, exposure to winds, and surrounding plants—factors relating to nutrition and protection. In like manner, the conditions most influencing animal structure, habit, and distribution are those relating to food (its nature and location) and protection (against other animals and climatic changes). A seemingly slight change in the nature of the environment may have a determining influence on the character of the animal life: in a pond, the animals living in the water body and feeding upon floating food differ in physiognomy and habit from the life confined to the muck and ooze of the bottom; and both groups differ from the surface striders or swimmers. Equally characteristic of the area are the air-breathers—birds and mammals—according to their station or the section they patrol, whether running along the shore, wading along the water margin, swimming and diving, or flying over the water surface. Fully as characteristic are the animals located in the various environment aspects of mountain, prairie, and woodland.

Field work should afford students the opportunity of becoming acquainted with the living forms on various topographic areas, and of knowing something of their structures and habits